C L A I M S

1. A method for the preparation of a titanium oxide coating on an implant comprising the steps of:

   a) adding a preparation containing an organic solvent and an organometallic titanium oxide precursor and optionally water and/or an acid with metal salts and/or with organometallic compounds to disperse metal ions homogeneously in the preparation wherein the metal ions exert an anti-microbial or antibacterial effect, respectively, under physiological conditions;
   b) applying the preparation prepared in a) onto an implant;
   c) drying the coating thus applied.

2. The method according to claim 1
   characterized in that
   after said step c) heating is conducted to 100 to 1000°C.

3. The method according to step 1 or 2
   characterized in that
   the implant is a metal, metal alloy, a glass, a ceramic, a plastic, a composite material, or a bone implant.

4. The method according to one or more of the preceding claims
   characterized in that
   said implant is a catheter, an osteosynthesis plate, an endoprosthesis, an external fixateur, an internal fixateur, a nail, a screw, and/or a wire, a heart valve, an artificial blood vessel, or a shunt, an implant for

facial/plastic surgery, a middle ear implant, or a dental implant.

5. The method according to one or more of the preceding claims
characterized in that
said metal in the case of a metallic implant is titanium, steel, iron and/or an alloy containing steel, iron, titanium and/or CoCr.

6. The method according to one or more of the preceding claims
characterized in that the metal alloy is a titanium alloy, preferably TiAl6V4 or TiAl6Nb7, a CoCr alloy or an osteosynthesis steel, preferably AISI316L.

7. The method according to one or more of the preceding claims
characterized in that
said plastic is polyethylene, polypropylene, polytetrafluoroethylene, polyethylene terephthalate, polyamides, polyurethanes, polysiloxanes, polysiloxane elastomers, polyetherether ketone, and/or polysulfone.

8. The method according to one or more of the preceding claims
characterized in that
as the organic solvent linear or branched alcohols with chain lengths of 2 to 8 carbon atoms or cyclic, aromatic or heteroaromatic hydrocarbons or derivatives thereof are used.

9. The method according to one or more of the preceding claims
characterized in that
the organometallic titanium oxide precursor is fourfold coordinated titanium having linear or branched alkyl and/or alkenyl radicals bound by oxygen bridges wherein the alkyl and/or alkenyl radicals preferably have a chain length of 2 to 5 carbon atoms and can have O and/or N atoms substituted or within the chain.

10. The method according to one or more of the preceding claims
characterized in that
as the acid nitric acid, hydrochloric acid, sulphuric acid, phosphoric acid, an organic acid or mixtures thereof are used.

11. The method according to one or more of the preceding claims
characterized in that
the metal salts and/or organometallic compounds have mono- to tetravalent metal ions, preferably zinc, mercury, vanadium, aluminium, titanium, chromium, cadmium, tin, lead, nickel and/or cobalt ions, more preferably calcium, magnesium, copper, zinc and/or silver ions.

12. The method according to one or more of the preceding claims
characterized in that
the metal ion concentration in step a) is selected to give a metal ion concentration of 1 - 20 % by weight, preferably 5 - 15 % by weight, still more preferred of

10 - 12 % by weight in the applied, dried and optionally heated coating.

13. The method according to one or more of the preceding claims
characterized in that
said application is carried out by dip coating, spin coating, blade coating, printing or spraying.

14. The method according to one or more of the preceding claims
characterized in that
the preparation of step a) is applied in a coating thickness that the coating thickness of a single coating after drying and optionally heating is 50 - 1000 nm, preferably 50 - 200 nm, more preferably 130 - 170 nm, most preferably about 150 nm.

15. The method according to one or more of the preceding claims
characterized in that
the preparation of step a) is applied in the form of a sol wherein said sol in which the metal salts and/or organometallic compounds are homogeneously dispersed and dissolved transforms into a gel during or after the application wherein the metal ions are homogeneously dispersed and dissolved.

16. The method according to one or more of the preceding claims
characterized in that
the steps a) - c) of claim 1 are repeated once or several times to generate one or more additional

titanium oxide coatings on the implant wherein each of the coatings can optionally be heated after step c) to 100 to 1000 °C.

17. The method according to claim 16
characterized in that
the metal ion concentration is varied in step a) to achieve different concentrations of metal ions in the original coating and the one or more additionally applied, dried and optionally heated coatings.

18. The method according to claim 16 or 17
characterized in that
the metal ion concentration is varied in step a) to achieve concentrations of metal ions in the original coating and in the one or more additionally applied, dried and optionally heated coatings decrease from the internal coatings close to the implant to the external coatings.

19. The method according to one or more of the preceding claims
characterized in that
drying of the coating applied in step c) is performed under supercritical conditions.

20. The method according to one or more of the claims 16-19
characterized in that
the individually applied coatings contain different metal ions.

21. The method according to one or more of claims 16-20
characterized in that

the antibacterial or anti-microbial metal ions, respectively, are copper ions and/or silver ions.

22. An implant having a titanium oxide coating which can be prepared according to one or more of the preceding claims.

23. The implant according to claims 22
characterized in that
the metal ions contained in the coating can be dissolved out of the coating into the surrounding medium under physiological conditions.

24. The implant according to claim 22 or 23
characterized in that
the layer thickness of each single titanium oxide coating is 50 - 1000 nm, preferably 50 - 200 nm, more preferred 130 - 170 nm, most preferably about 150 nm.

25. The implant according to one or more of the claims 22 - 24
characterized in that
the metal ions are homogeneously dispersed in each titanium oxide coating.

26. The implant according to one or more of the claims 22 - 25
characterized in that
the metal ions are contained in the titanium oxide coating in a concentration that the coating initially has an antibacterial effect and that it is biocompatible after an adjustable time.

27. The implant according to one or more of the claims 22 - 26
characterized in that
the metal ion concentration in a titanium oxide coating is 1 - 20 % by weight, preferably 5 - 15 % by weight, still more preferred of 10 - 12 % by weight.

28. The implant according to one or more of the claims 22 - 27
characterized in that
the metal ions contained in the titanium oxide coating are copper ions and/or silver ions.

29. The use of the implant according to one or more of claims 22 - 28 for implantation into patients.